Gunn Diode Oscillator Minutes

David Headland

2003-12-04 14:00

Attendance

- Fourth year students:
  - DP Headland.
  - R Wan.
  - JM Higginbotham.
  - MP Gaskill.
- UMIST Staff:
  - R Sloan.
  - WS Truscott.

Apologies

- RE Irwin.

Approvals

- The minutes from the previous meeting were approved.

Simulation labs

- The email about ADS labs was discussed.
- Some people have not received the email.
- RE Irwin and DP Headland will not be able to attend due to tomography module reorganisations.
- The matter was discussed further with R Sloan.
- Proposed checks were discussed.
- RF power going up the radial line transformer is important.
- The usefulness of HFSS was questioned for certain situations.
- Models with the radial line transformer were suggested.

Waveguide fabrication

- A W-band waveguide flange combining the diode and the backshort has been designed.
- Different possibilities were discussed.
- A diagram of possibilities was shown.
- Tolerances in manufacture of waveguides are ± 2 mils.
- The British Standards suggest a surface finish of 6–3 μm for waveguides, which refers to the roughness of the surface.
- Further discussion was entered into with WS Truscott.
- 3 μm is achievable in the UMIST workshops.
- Three main points for the finish were decided upon:
  - The two halves to be clamped must be well finished.
  - The inside of the cavity must be well finished.
  - The outside surface does not matter as much.
- Fabrication methods were discussed.
- Adding channels near the cavity was suggested as future work.

Backshort

- The backshort in the e2v waveguide contains a filter.
- R Sloan suggest just doing a plain backshort.
- Adjusting the backshort position is critical, and may required specialised machinery.
- e2v uses specialised tools for this.
- A fixed radial line transformer with an adjustable backshort was decided upon.
- Keeping the initial design simple was suggested.
- Alternative approaches may be required for power combining.
- Further discussion was entered into with WS Truscott.
- The first section would normally be $\frac{\lambda}{4}$ long.
- Since we are using harmonics, our target will probably by closer to $\frac{\lambda}{6}$.
- Calculations must be done.
- It was suggested that three diode combining should be mentioned to the workshops.

Waveguide drawings

- Drawings were discussed with R Sloan.
- Dimensions should be placed outside the objects with construction lines indication where they apply.
- Hole dimensions were discussed.

Interim report

- A list of achievements was discussed for the summary section.
- Clarification was provided of the tests performed.
- The future work section was discussed.
- Suggestions for future work were provided.
- Tests were suggested by e2v and listed in the minutes for the visit to Lincoln.

Power supply

- The power supply was discussed.
- e2v do make power supplies.
- Circuit diagrams are available.
- Ours could be based on a e2v design but with multiple outputs.

Vector network analyser

- The function of the device was discussed.
- It measured the S parameters of forward and reflected waves.
- Will effectively measure the input and transfer impedances.
- Will output power and phase reflected (ideally zero).
- Will apply waveguide impedance corrections if required.

Power estimates

- Power estimates for tested devices were discussed.
- The antenna gain will be approximately 10 dB (1).
- Power will be spread over a sphere's surface if radiating isotropically.
- For a waveguide, this will not be true, so calculating the effective aperture of the antenna will be required.

P drive problems

- Problems with the P drive were discussed with WS Truscott.
- Help from ISD has been requested.
- The suggestion was made to talk to ISD face-to-face.

Group meal

- A reminder was made of the group meal next Thursday.

Proposed actions

All	Main focus: Continue work on the interim report.
DP Headland	Send mail about ADS lab to MP Gaskill.
AJ Nelms	Provide quantitative measurement of the air gap used in testing.
DP Headland	Mail R Sloan regarding out of hours working.

Next meeting

Time Tuesday 9 December 2003, 10:00.

Place D floor coffee room.

Meeting adjourned, 15:27.